

produces growths having the form of bunches of grapes, consisting of great numbers of stalks on a central axis, each bearing a dense rounded mass of small aborted leaves.—T. D. A. COCKERELL, *Mesilla, N. M.*

STOMATA ON THE BUD SCALES OF ABIES PECTINATA.

IN the Metaspermæ stomata occur on all normal leaves. They are also usually found on all of their well developed bud scales.

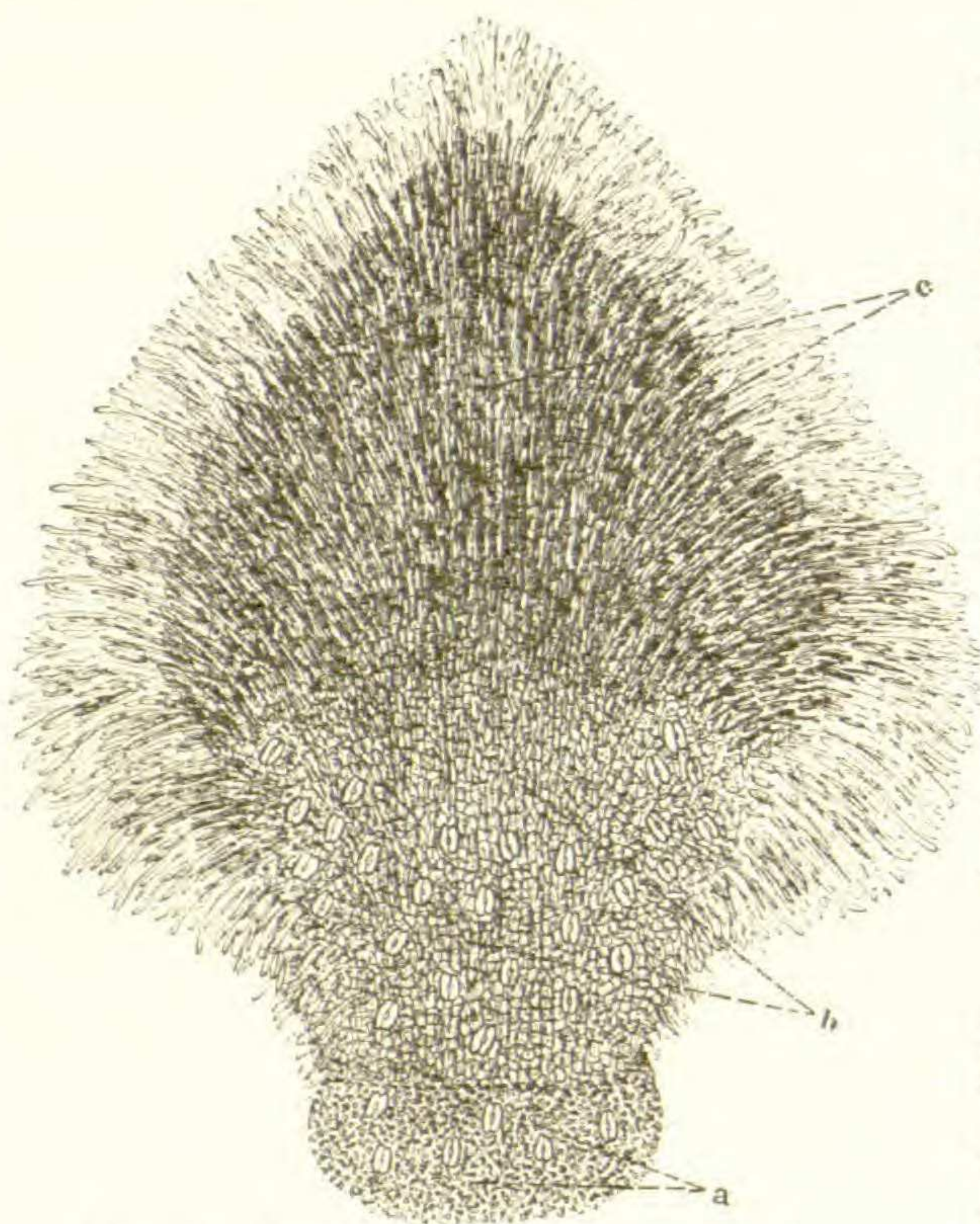


FIG. 1.—Dorsal surface of one of the bud scales of *Abies pectinata*, with stomata; *a*, a part of the axis and decurrent swelling, or pulvinus at the base of the scale; *b*, part of the scale which was covered over by the next lower bud scales, showing stomata; *c*, part of the scale which was exposed to the atmosphere. Epidermal cells thick walled and sclerotic. No stomata.

The needle like leaves of the Coniferæ are smaller, and hence have fewer stomata than the leaves of the Metaspermæ. On this account one would expect to find fewer or no stomata on their morphological equivalents, the bud scales. This has been found to be true, and it has always been thought that stomata never occur on the bud scales of the Coniferæ.

Grüss¹ says that stomata are never present on the bud scales of the Coniferæ. Schumann² makes the same statement. In a recent paper³ the writer called attention to the occurrence of stomata on the bud scales of *Abies pectinata*.

Normal leaves of *A. pectinata* have stomata only on their lower surfaces, where

¹ GRÜSS, J.: Beiträge zur Biologie der Knospe. Jahrbücher für wissen. Botanik 23:642.

² SCHUMANN, C. R. G.: Anatomische Studien über die Knospenschuppen von Coniferen und dicotylen Holzgewächsen. Bibliotheca Botanica 15:3. 1889.

³ Ueber abnorme Bildung von Harzbehältern, etc. Sonderabdruck aus der Forst.-naturw. Zeitsch. 1896. S. 15.

they are arranged in two bands, one on each side of the midrib of the leaf. Each band is made up of from nine to fourteen rows of stomata. The stomata are never found on the midrib of the leaf.

The presence of stomata on the bud scales can best be demonstrated by mounting them in chloral hydrate. This clearing agent will make the scale more transparent, cause considerable swelling of the cell walls, and increase the guard cells of the stomata to their original size, rendering them visible from the exterior.

In the bud scales, as in their morphological equivalents, the leaves, the stomata are found only on the dorsal or lower surface of the scale. They are found only near the base of the scale and on that part of the epidermis which was covered over in the bud by the next lower scales. The cells of this part of the epidermis never become sclerotic, but remain thin walled (*fig. 1, b*). The exposed epidermal cells become sclerotic, and stomata never occur on this portion of the scale (*fig. 1, c*).

Stomata are found also on the axis of the bud and on the decurrent swelling or pulvinus of the scale (*fig. 1, a*). Stomata are found on the pulvini of all the scales, but on the scale laminae they occur only on the larger and well developed ones. They are found on the outer or lower exposed scales, as well as on the inner or upper ones. The stomata are not as regularly distributed in rows as they are on the leaves. They are found isolated and in groups, occurring also on the midrib portion of the scale itself.—ALEXANDER P. ANDERSON, *Clemson College, South Carolina*.

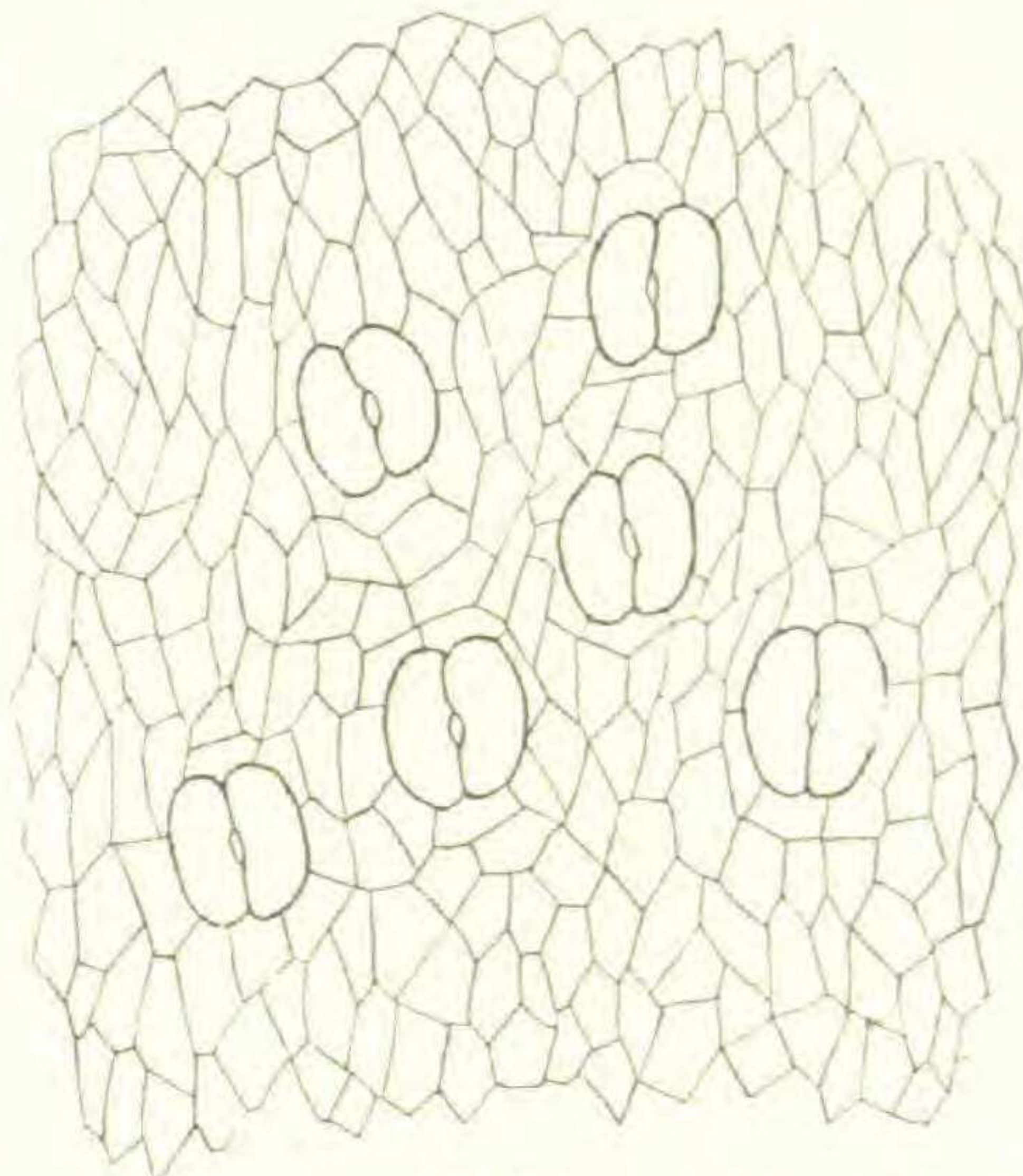


FIG. 2.—Highly magnified portion of dorsal side of a scale with stomata.